

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter I of the Patent Cooperation Treaty)

(PCT Rule 44bis)

Applicant's or agent's file reference M/PLU-191-PC	FOR FURTHER ACTION	See item 4 below
International application No. PCT/EP2006/009886	International filing date (<i>day/month/year</i>) 12 October 2006 (12.10.2006)	Priority date (<i>day/month/year</i>) 02 November 2005 (02.11.2005)
International Patent Classification (8th edition unless older edition indicated) See relevant information in Form PCT/ISA/237		
Applicant PLUS ORTHOPEDICS AG		

1.	This international preliminary report on patentability (Chapter I) is issued by the International Bureau on behalf of the International Searching Authority under Rule 44 bis.1(a).																								
2.	This REPORT consists of a total of 14 sheets, including this cover sheet. In the attached sheets, any reference to the written opinion of the International Searching Authority should be read as a reference to the international preliminary report on patentability (Chapter I) instead.																								
3.	<p>This report contains indications relating to the following items:</p> <table style="width: 100%;"> <tr> <td style="width: 10%; text-align: center;"><input checked="" type="checkbox"/></td> <td style="width: 30%;">Box No. I</td> <td style="width: 60%;">Basis of the report</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. II</td> <td>Priority</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. III</td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. IV</td> <td>Lack of unity of invention</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. V</td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. VI</td> <td>Certain documents cited</td> </tr> <tr> <td style="text-align: center;"><input type="checkbox"/></td> <td>Box No. VII</td> <td>Certain defects in the international application</td> </tr> <tr> <td style="text-align: center;"><input checked="" type="checkbox"/></td> <td>Box No. VIII</td> <td>Certain observations on the international application</td> </tr> </table>	<input checked="" type="checkbox"/>	Box No. I	Basis of the report	<input type="checkbox"/>	Box No. II	Priority	<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	Box No. IV	Lack of unity of invention	<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input checked="" type="checkbox"/>	Box No. VI	Certain documents cited	<input type="checkbox"/>	Box No. VII	Certain defects in the international application	<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application
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4.	The International Bureau will communicate this report to designated Offices in accordance with Rules 44bis.3(c) and 93bis.1 but not, except where the applicant makes an express request under Article 23(2), before the expiration of 30 months from the priority date (Rule 44bis .2).																								

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland	Date of issuance of this report 08 July 2008 (08.07.2008)
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PATENT COOPERATION TREATY

From the
INTERNATIONAL SEARCHING AUTHORITY

TRANSLATION
PCT

WRITTEN OPINION OF THE
INTERNATIONAL SEARCHING AUTHORITY

(PCT Rule 43bis.1)

To:

Date of mailing (day/month/year) **See form PCT/ISA/210**

Applicant's or agent's file reference M/PLU-191-PC		FOR FURTHER ACTION See paragraph 2 below	
International application No. PCT/EP2006/009886	International filing date (day/month/year) 12.10.2006	Priority date (day/month/year) 02.11.2005	
International Patent Classification (IPC) or both national classification and IPC A61L27/00 A61L27/56			
Applicant PLUS ORTHOPEDICS AG			

1. This opinion contains indications relating to the following items:

- | | | |
|-------------------------------------|--------------|--|
| <input checked="" type="checkbox"/> | Box No. I | Basis of the opinion |
| <input type="checkbox"/> | Box No. II | Priority |
| <input type="checkbox"/> | Box No. III | Non-establishment of opinion with regard to novelty, inventive step and industrial applicability |
| <input type="checkbox"/> | Box No. IV | Lack of unity of invention |
| <input checked="" type="checkbox"/> | Box No. V | Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement |
| <input checked="" type="checkbox"/> | Box No. VI | Certain documents cited |
| <input type="checkbox"/> | Box No. VII | Certain defects in the international application |
| <input checked="" type="checkbox"/> | Box No. VIII | Certain observations on the international application |

2. **FURTHER ACTION**

If a demand for international preliminary examination is made, this opinion will be considered to be a written opinion of the International Preliminary Examining Authority ("IPEA") except that this does not apply where the applicant chooses an Authority other than this one to be the IPEA and the chosen IPEA has notified the International Bureau under Rule 66.1bis(b) that written opinions of this International Searching Authority will not be so considered.

If this opinion is, as provided above, considered to be a written opinion of the IPEA, the applicant is invited to submit to the IPEA a written reply together, where appropriate, with amendments, before the expiration of 3 months from the date of mailing of Form PCT/ISA/220 or before the expiration of 22 months from the priority date, whichever expires later.

For further options, see Form PCT/ISA/220.

3. For further details, see notes to Form PCT/ISA/220.

Name and mailing address of the ISA/EP	Date of completion of this opinion	Authorized officer
Facsimile No.		Telephone No.

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Box No. I Basis of this opinion

1. With regard to the **language**, this opinion has been established on the basis of:
 - ☒ the international application in the language in which it was filed
 - ☐ the translation of the international application into _____, which is the language of a translation furnished for the purposes of international search (Rule 12.3(a) and 23.1(b)).
2. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application and necessary to the claimed invention, this opinion has been established on the basis of:
 - a. type of material
 - ☐ a sequence listing
 - ☐ table(s) related to the sequence listing
 - b. format of material
 - ☐ on paper
 - ☐ in electronic form
 - c. time of filing/furnishing
 - ☐ contained in the international application as filed
 - ☐ filed together with the international application in electronic form
 - ☐ furnished subsequently to this Authority for the purposes of search
3. ☐ In addition, in the case that more than one version or copy of a sequence listing and/or table(s) relating thereto has been filed or furnished, the required statements that the information in the subsequent or additional copies is identical to that in the application as filed or does not go beyond the application as filed, as appropriate, were furnished.
4. Additional comments:

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Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement		
1. Statement			
Novelty (N)	Claims	<u>20-33, 35</u>	YES
	Claims	<u>1-19, 34, 36, 37</u>	NO
Inventive step (IS)	Claims	<u>21-33, 35</u>	YES
	Claims	<u>1-20, 34, 36, 37</u>	NO
Industrial applicability (IA)	Claims	<u>1-37</u>	YES
	Claims	<u>-</u>	NO
2. Citations and explanations:			
1. Prior art			
<p>Reference is made to the following documents:</p> <p>D1 = EP 1035 230 A1 (Bristol-Myers Squibb Company) 19 September 2000</p> <p>D2 = WO 01/72664 A1 (Ceramtec AG), 4 October 2001</p> <p>D3 = DE 10022162 A1 (Deutsches Zentrum für Luft- und Raumfahrt e.V.) 22 November 2001</p> <p>D4 = WO 86/006617 A1 (Plasmainvent AG) 20 November 1986</p> <p>D5 = WO 01/19556 A1 (Stratec Medical AG) 22 March 2001; cited by the applicant</p> <p><i>Insofar as the claimed subject matter of the present application can be understood (see Box VIII), the following remarks must be made concerning novelty and inventive step:</i></p>			
2. Novelty			
<p>2.1 As remarked in Box VIII (paragraph 2), it is pointed out that comparison of the claimed subject matter</p>			

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citations and explanations supporting such statement

with the prior art is not possible when unusual parameters are present. If, therefore, a different parameter or no parameter at all is mentioned in the prior art, and if the known and claimed products are otherwise completely identical, it will be objected that novelty is lacking until the applicant is able to demonstrate, e.g. by suitable comparative tests, that there are differences in the parameters and thus in the products.

2.2 Document D1 discloses (the references between parentheses refer to this document): an orthopaedic implant which has a porous surface layer. Particles are provided with a sintering aid (page 2, lines 11-12) before they are applied by a plasma spray-coating process to the surface of an implant (page 4, line 38). The substrate may consist of titanium (page 2, line 8) and the sintering aid may consist of silicon, which lowers the melting point of the particles to be applied (page 4, line 24). The implant is used as joint implant for hip, knee, shoulder and elbow (page 3, line 29). Accordingly, the subject matter of claims 1-19, 34, 36, 37 is not novel over D1 within the meaning of PCT Article 33(2).

2.3 Document D2 discloses (the references between parentheses refer to this document): an open-pore surface layer for an implant (page 7, lines 25-27) which has a coherent pore network, thus promoting the growth of bone tissue onto or into it (page 12, line 8 - page 13, line 6; figure 3, 4). The implant

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is a socket for a hip joint. The porous layer may additionally have a thin layer of hydroxyapatite which promotes bone growth (page 8, lines 4-9). The layer thicknesses are in the range 0.1-2 mm (page 7, line 16). The porosity of the layer is between 25% and 70% (page 5, lines 26-27). The diameter of the pores is 20-500 μm (page 5, line 30). The pores are open as far as the base body (page 11, line 4). Accordingly, the subject matter of claims 1-18, 36, 37 is not novel over D2 within the meaning of PCT Article 33(2).

- 2.4 Document D3 discloses (the references between parentheses refer to this document): an open-pore, porous surface layer for an implant which is produced by a vacuum plasma spray-coating process (column 2, lines 63-67). The porosity is between 10% and 50% (column 4, line 11). The particle sizes are in the range between 10 and 800 μm , or between 100 and 250 μm (column 4, lines 28-30). The implant is for example a hip joint socket (column 6, line 65; column 7, lines 33-35; figure 3) or a knee implant (column 7, lines 3-45; figure 4). The shape of the employed particles is retained in the process (column 6, lines 21-22), and the individual powder particles are melted only on the surface, resulting in a structure into which bone substance can grow. Coating thicknesses of 10 μm (0.01 mm) to 2000 μm (2 mm) are attained (column 5, lines 8-11). Hydroxyapatite can be embedded in the pore structure (column 5, lines 43-50). Accordingly, the subject matter of claims 1-18, 36,

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	<p>37 is not novel over D3 within the meaning of PCT Article 33(2).</p> <p>2.5 Document D4 discloses (the references between parentheses refer to this document): an open-pore surface layer for an implant which has a sponge-like structure (page 2, lines 28-30) which provides ideal conditions for bone tissue to grow into it (page 3, lines 25-29). The porous layer may comprise hydroxyapatite (page 3, line 13). A titanium-containing intermediate layer is present between the material and the covering layer (page 5, lines 9-12). The layers are together not more than 200 μm thick (page 5, lines 18-20). The particles are put onto the substrate by a vacuum plasma spray-coating process, the pore size being set by the size used for the particles to be melted (page 6, lines 20-27).</p> <p>Accordingly, the subject matter of claims 1-18, 36 is not novel over D4 within the meaning of PCT Article 33(2).</p> <p>2.6 Document D5 discloses (the references between parentheses refer to this document): a porous shaped article which can be used as covering for a surgical implant (page 17, claim 24) and which consists of a two-phase mixture of particles which forms a low-melting alloy at the start of the sintering process (page 15, claim 13). The material used is titanium (page 6, line 25 - page 7, line 2). The metallic cell structure and internal surface area and the volume are retained during this process (page 6,</p>

Box No. V	Reasoned statement under Rule 43bis.1(a)(i) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
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lines 21-24).

Accordingly, the subject matter of claims 1-18, 36 is not novel over D5 within the meaning of PCT Article 33(2).

2.7 The present application does not meet the requirements of PCT Article 33(1) because the subject matter of claims 1-19, 34, 36, 37 is not novel within the meaning of PCT Article 33(2).

3. Inventive step

3.1 Document D3 is regarded as closest prior art to the subject matter of the present international application. It discloses (the references between parentheses refer to this document): an implant which comprises an open-pore covering, where the porosity formation can be controlled by the adjustment of a vacuum plasma spray-coating process, thus in turn allowing bone substance to grow into it (columns 2 and 3).

3.2 The subject matter of claim 20 differs from D3 in that in addition to the production of an open-pore layer by a vacuum plasma spray-coating process, this is followed by generation of an arc between the surface of the implant and a counter-electrode.

3.3 The problem addressed by the present invention can therefore be considered that of providing a low-temperature sintering process which permanently retains the roughness and porosity throughout of an

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implant surface which is optimally suitable for bone tissue to grow into it.

- 3.4 The solution proposed in claim 20 of the present application cannot be regarded as inventive (PCT Article 33(3)) for the following reasons: the local sintering produced as a result of joule heating is shown in the present application only for titanium particles provided with a sintering aid (see also Box VIII; paragraph 4). It is not evident from the present application how it is possible with pure metal particles for a local heating effect between the particles to come about so that the metal particles are able to join together at low temperatures.

An inventive step within the meaning of PCT Article 33(3) therefore cannot be acknowledged for the subject matter of claim 20.

- 3.5 Claim 21 proposes a method making it possible by an arc method to promote targeted melting of the surface of titanium particles provided with sintering aids, and thus to make it possible by a brief local liquid-phase sintering to join the particles stably both to the substrate and to one another. This makes it possible not only for bone to grow into the coherent pore network, but also for bone cells to be retained on a microscopically structured pore surface.

It is true that the fact that increasing the porosity and roughness of a substrate facilitates the growing in of tissue is known from the relevant

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literature. It is also known that the metallic cell structure can be attained, with retention of the internal surface areas and volumes, by keeping the sintering temperature as low as possible. The latter is evident for example from documents D1 (page 3, paragraphs [0021]-[0023]) and D5 (page 6, lines 21-30). It is also true that these documents disclose the possibility of employing a sintering aid which lowers the melting point of the metal particles employed. However, a person skilled in the art would not without being inventive have recourse to this possibility in conjunction with the generation of an arc in order to make local sintering of the particles together and also to the surface possible at lower temperature and thus to maximize the porosity of the surface.

The combination of features in dependent claims 21-33, 35 is not disclosed or suggested in the available prior art. An inventive step within the meaning of PCT Article 33(3) can therefore be acknowledged for the subject matter of claims 21-33, 35.

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Box No. VI Certain documents cited

1. Certain published documents (Rule 43bis.1 and 70.10)

Application No. Patent No.	Publication date (day/month/year)	Filing date (day/month/year)	Priority date (valid claim) (day/month/year)
WO 2006/020090	23.02.2006	18.07.2005	19.07.2004

2. Non-written disclosures (Rule 43bis.1 and 70.9)

Kind of non-written disclosure	Date of non-written disclosure (day/month/year)	Date of written disclosure referring to non-written disclosure (day/month/year)
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see form 210

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Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

- 1.1 The present claim 1 relates to a product characterized *inter alia* by reference to the following unusual parameter:
- “*internal surface area*” with corresponding unit “ $\mu\text{m}/\mu\text{m}^2$ ”.
- 1.2 The use of this unusual parameter in the present context leads to a lack of clarity. The claim does not define the products falling within its scope of protection clearly because the parameter cannot be unambiguously and reliably determined with the information given in the application or by objective methods conventional in the state of the art. Comparison of the claimed subject matter with the prior art is thus impossible. For this reason, the claim does not meet the clarity requirements of PCT Article 6.
- 1.3 The same objection likewise applies to the unusual parameters from claim 2 “*shear force*”, and from claim 3 “*cutting work for shearing off*”, claim 4 “*average diameter of sintered necks*”, claim 5 “*abrasion of the surface layer*”, claim 8 “*region of a pore mouth*” and claim 16 “*axis ratio of particles*”.
- 1.4 The non-compliance with the clarity requirements is so serious that it has been taken into account for the purposes of determining the extent of the search

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for claims 1-5, 8, 16 and dependent claims 6, 7, 9-15, 17, 18. The search and the present search report have therefore been restricted to the example which is clearly defined in the description, see the description of the present application on pages 18 (line 20) to 19 (line 28).

2. Claims 1-10, 13-18, 26, 27 do not meet the requirements of PCT Article 6 because the subject matter for which protection is sought is not clearly defined. The claims attempt to define the subject matter in terms of the result to be achieved, but in so doing merely state the problem to be solved without providing the technical features necessary to achieve this result.
3. The invention is defined in claims 2, 3, 8, 12 and 16 by parameters for which the methods of measurement are either not defined or are defined in a way not routine for a person skilled in the art. Since it cannot be assumed that the methods mentioned lead to the same result, both the method of measurement and the means of measurement must be included in the abovementioned claims in order to define the subject matter for which protection is sought (PCT Article 6).
4. The expressions "compounding" and "compounded particles" used in claims 13, 16, 19, 21, 25-28, 30 are vague and unclear and leave the reader uncertain as to the meaning of the technical features in question, because a person skilled in the art would

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not necessarily start from a "coating" of the particles as claimed by the present application. As a result, the subject matter of these claims is not clearly defined (PCT Article 6). Since a person skilled in the art would not be able to carry out the claimed compounding of metal particles, the abovementioned claims are not supported by the description as required by PCT Article 6.

5. It is evident from the description on pages 18 and 20 that the following features are essential for defining the invention:

- (1) the titanium particles are coated with silicon
- (2) an arc is generated.

Since independent claims 19 and 20 contain these features only in part or not at all, they do not meet the requirement of PCT Article 6 in conjunction with PCT Rule 6.3(b) that each independent claim must include all the technical features essential to the definition of the invention.